

REMARKS

In the Office Action, allowed claim 81 was mistakenly omitted from the list of pending claims. Applicant notes that, upon entry of the foregoing Amendment, claims 1-60, 66, and 68-81 are pending in the present application, with claims 1, 19, 38, 48, 59, 60, 66, 69, 70, 73, 75, and 77 being the independent claims. Claims 60 and 73 have been amended merely to correct informalities. The amendment of claims 60 and 73 is not intended to change their scope. Claims 61 and 63-65 have been canceled without prejudice to or disclaimer of the subject matter therein. Claims 62 and 67 were previously canceled.

Based on the above amendment and the following remarks, Applicant respectfully requests that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn. No new issues requiring further search or consideration by the Examiner are presented.

Allowed claims

Claims 38-58, 66, 68, 69, 80, and 81

Applicant acknowledges with gratitude the Examiner's allowance of claims 38-58, 66, 68, 69, 80, and 81.

Allowable claims

Claims 9-18, 27-37, and 78-79

Claims 9-18, 27-37, and 78-79 were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. As set forth in the remarks below, Applicant respectfully submits that the independent claims from which these claims depend are patentable, and thus respectfully requests that the objection to claims 9-18, 27-37, and 78-79 be withdrawn and that these claims be passed to allowance.

Rejections Under 35 U.S.C. § 102**Claims 19, 60, and 63**

Claims 19, 60, and 63 have been rejected under 35 U.S.C. § 102(b) as being anticipated by the Back Ground Invention (hereinafter “BGI”). Applicant respectfully traverses this rejection.

Independent claim 19 recites, among other features, *using a measurement channel to sequentially measure a first voltage on a first side of said load component, and one of a second voltage on a second side of said load component or a voltage difference across said load component*. The Examiner relies on Figure 1 and page 2, lines 10-16 of the “Background of the Invention” section of the present application to allegedly teach this feature. However, Applicant respectfully submits that nothing in the cited material teaches this feature.

The BGI has two channels connected to opposing sides of the load resistor 2. Each measurement channel is dedicated to measuring a voltage on its respective side of the load resistor 2. Furthermore, the text at the top of page 4 of the present application explicitly states that the measurements are taken simultaneously in the BGI system, i.e., not sequentially (one after the other).

The Applicant's method, on the other hand, requires that a (i.e., single) measurement channel sequentially measures both voltages (or the difference voltage). The BGI fails to disclose this important feature of claim 19. For example, there is no disclosure in the BGI of this occurring in the prior art. Clearly the method recited in claim 19 is different from the method described in the BGI. Two measurement channels making simultaneous measurements, as described in the BGI, is not the same as a single measurement channel making sequential measurements, as set forth in claim 19. Thus, the BGI does not anticipate claim 19.

As stated in the Applicant's description, the switch arrangement of the present invention provides an apparatus that has only one measurement channel to perform two sequential measurements of voltages on either side of a load component. Since there is only one measurement

channel comprising a low pass filter 29 and the analog-to-digital converter 30, there is no requirement for accurate gain and phase matching of two filters and analogue-to-digital converters. Furthermore, since all measurements are carried out using a single measurement channel, all measurements are equally affected by the characteristics of the measurement channel, and thus in the calculations these factors cancel out.

For at least these reasons, Applicant submits that independent claim 19 is distinguishable over the BGI. Claims 20-37, which depend from independent claim 19, also distinguish over the BGI for at least the same reasons as those set forth above with respect to independent claim 19, and further in view of their own respective features. Moreover, independent claim 60 is distinguishable over the BGI for at least reasons similar to those set forth above with respect to independent claim 19, and further in view of its own features. Claim 63 has been canceled.

Applicant therefore respectfully requests that the rejection of claims 19, 60, and 63 be reconsidered and withdrawn, and that these claims and their dependent claims be passed to allowance.

Rejections Under 35 U.S.C. § 103

Claims 20-23, 25-26, 61, and 64-65

Claims 20-23, 25-26, 61, and 64-65 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the BGI in view of U.S. Pub. No. 2003/0222639 to Slates *et al.* (hereinafter "Slates"). Applicant respectfully traverses this rejection.

Claims 20-23 and 25-26, all of which depend from independent claim 19, are also distinguishable over the BGI for at least the same reasons as those set forth above with respect to independent claim 19, and further in view of their own respective features. Moreover, Slates does not provide the teachings that are missing from the BGI. Slates concerns a digital eddy current proximity system which, like the known measuring device shown in Figure 1 of the Applicant's application, uses two separate Analogue-to-Digital (ADC) converters to take readings across the

unknown load and the known load, and across the known load, respectively. *See, e.g.,* Slates, paragraph [0016]. However, nothing in Slates teaches or suggests *using a measurement channel to sequentially measure a first voltage on a first side of said load component, and one of a second voltage on a second side of said load component or a voltage difference across said load component*. Thus, Applicant submits that claims 20-23 and 25-26 are patentable over the combination of the BGI and Slates.

Claim 20 is also patentable over the combination of the BGI and Slates for the additional, independent reason that nothing in the cited combination teaches or suggests a signal comprising sequential signal blocks, much less *a signal comprising sequential signal blocks for application to said series connected load component and device, wherein said measurement channel is used to measure each of said voltages during the same part of the signal block of sequential signal blocks of said signal*, as set forth in claim 20. Claim 21, which depends from claim 20, is also patentable over the combination of the BGI and Slates for the same additional reason, and further in view of its own features.

Claims 61, 64, and 65 have been canceled, thereby rendering the rejection of these claims moot.

Applicant therefore respectfully requests reconsideration and withdrawal of the rejection of claims 20-23, 25-26, 61, and 64-65, and that claims 20-23 and 25-26 be passed to allowance.

Claims 1, 6, 24, 59, and 70-72

Claims 1, 6, 24, 59, and 70-72 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the BGI in view of U.S. Patent No. 6,816,797 to Freeman *et al.* (hereinafter “Freeman”). Applicant respectfully traverses this rejection.

Independent claim 1 recites, among other features, *a measurement channel for measuring voltages and a switch arrangement connected to said measurement channel for switching the measurement channel to sequentially measure a first voltage on a first side of said load*

component, and one of a second voltage on a second side of said load component or a voltage difference across said load component.

The Examiner concedes that the BGI fails to teach a switch arrangement connected to said measurement channel for switching the measurement channel. Instead, the Examiner relies on Figure 3, Col. 4, lines 1-4 and Col. 6, lines 39-50 of Freeman to allegedly teach this feature. Applicants respectfully submits that Freeman does not remedy the deficiencies of the BGI.

Freeman concerns measuring impedance and voltage characteristics of cells of multi-cell electrochemical devices, such as batteries and fuel cell stacks. In Freeman, a test fuel cell stack 90 is connected in series with a load bank 100, which can be set to apply a desired voltage or draw a desired current. Freeman, Col. 5, lines 16-20. The load bank 100 may provide a stable output for the fuel cell stack 90. Voltages are measured across individual cells or groups of cells in the stack 90, and signals representative of these voltages are connected through a channel splitting device 21 and an analog multiplexer 22 to an A/D converter 70. Freeman, Col. 5, lines 36-46.

Freeman discloses in col. 4, lines 1-4 that a multiplex control line is connected between a controller and the analog multiplexer 22 for controlling the analog multiplexer 22 to switch sequentially between the channels to which the analog multiplexer 22 is connected. However, nothing in Freeman teaches or suggests *a switch arrangement connected to said measurement channel for switching the measurement channel to sequentially measure a first voltage on a first side of said load component, and one of a second voltage on a second side of said load component or a voltage difference across said load component*, as recited in claim 1.

Freeman merely discloses that a plurality of differential amplifiers 120 has inputs connected to the terminals of the fuel cells in the fuel cell stack 90 and outputs connected to the channel splitting device 21. The channel splitting device 21 has a plurality of outputs connected to the analog multiplexer 22, which has an output connected to the A/D converter 70. The A/D converter 70 converts the analog data from the analog multiplexer 22 into digital format and

supplies the data to the CPU 20 for analysis. However, nothing in Freeman teaches or suggests a switching arrangement as recited in claim 1.

To the contrary, it can be seen clearly from Figure 1 of Freeman that multiplexer 22 only multiplexes signals relating to voltage measurements across cells in the fuel cell stack 90. The multiplexer does not switch any signals relating to measurements of voltages across the “load”, as suggested in the Office Action.

As stated in the Applicant's description, the switch arrangement of the present invention provides an apparatus that has only one measurement channel to perform two sequential measurements of voltages on either side of a load component. Since there is only one measurement channel comprising a low pass filter 29 and the analog-to-digital converter 30, there is no requirement for accurate gain and phase matching of two filters and analogue-to-digital converters. Furthermore, since all measurements are carried out using a single measurement channel, all measurements are equally affected by the characteristics of the measurement channel, and thus in the calculations these factors cancel out.

Neither the BGI nor Freeman teach or suggest that a switch arrangement as set forth in claim 1 is advantageous, or even desirable. There would therefore be no motivation for the skilled person to even consider looking at Freeman. And even if *arguendo* the skilled person were to look to Freeman, he would not find a switch arrangement connected to said measurement channel as recited in Applicant's claim 1.

For at least these reasons, Applicant submits that independent claim 1 is patentable over the combination of the BGI and Freeman. Claim 6, which depends indirectly from claim 1, is also patentable over the combination of the BGI and Freeman for at least the same reasons as those set forth above with respect to independent claim 1, and further in view of its own features.

Claim 24, which depends from independent claim 19, is also distinguishable over the BGI for at least the same reasons as those set forth above with respect to independent claim 19, and further in view of its own features. Moreover, Freeman does not provide the teachings that are

missing from the BGI. Thus, Applicant submits that claim 24 is patentable over the combination of the BGI and Freeman.

Moreover, independent claim 59 is patentable over the combination of the BGI and Freeman for at least reasons similar to those set forth above with respect to independent claim 1, and further in view of its own features.

Independent claim 70 recites, among other features:

a switch connected to switch between said first end of said impedance component and a second end of said impedance component;
and

a processor ... adapted to control said switch to switch to connect to said first and second ends of said impedance component sequentially.

The Examiner concedes that the BGI fails to teach these features. Instead, the Examiner relies on analog multiplexer 22, as shown in Figure 1 and described in Col. 4, lines 1-4 and Col. 6, lines 39-50 of Freeman to allegedly teach the switch of claim 1. The Examiner further relies on CPU 20, as shown in Figure 1 and described in Col. 7, lines 47-60 of Freeman to allegedly teach the processor of claim 1. However, Applicant respectfully submits that Freeman does not remedy the deficiencies of the BGI.

Thus, Applicant submits that independent claim 70 is patentable over the combination of the BGI and Freeman. Claims 71 and 72, which depend from independent claim 70, are also patentable over the combination of the BGI and Freeman for at least the same reasons as those set forth above with respect to independent claim 70, and further in view of their own respective features.

Applicant therefore respectfully requests reconsideration and withdrawal of the rejection of claims 1, 6, 24, 59, and 70-72, and that these claims and their dependent claims be passed to allowance.

Claims 2-5 and 7-8

Claims 2-5 and 7-8 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the BGI in view of Freeman and Slates. Applicant respectfully traverses this rejection.

Claims 2-5 and 7-8, all of which depend from independent claim 1, are also patentable over the BGI and Freeman for at least the same reasons as those set forth above with respect to independent claim 1, and further in view of their own respective features. Moreover, Slates does not provide the teachings that are missing from the BGI and Freeman. Thus, Applicant submits that claims 2-5 and 7-8 are patentable over the combination of the BGI, Freeman, and Slates.

Applicant therefore respectfully requests reconsideration and withdrawal of the rejection of claims 2-5 and 7-8, and that these claims be passed to allowance.

Claims 73-76

Claims 73-76 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the BGI in view of U.S. Pub. No. 2003/0156367 to Macbeth *et al.* (hereinafter “Macbeth”). Applicant respectfully traverses this rejection.

Independent claim 73 recites, among other features, *a measurement arrangement adapted to sequentially measure a first voltage on one side of said load component, and a second voltage on the other side of said load component or a difference voltage comprising the voltage difference across said load device.*

The Examiner relies on Figure 1 and Page 2, lines 10-16 of the BGI to allegedly teach this feature. The cited material reads as follows:

A voltage v_s is measured as the voltage across the proximity sensor 1 by connecting a first analogue-to-digital converter 7 via a low pass filter 8. The output of the analogue-to-digital converter 7 is input to the processor 3. A second voltage v_o is measured as the voltage across the series connected load resistance 2 and the proximity sensor 1. A second

analogue-to-digital converter 9 receives the voltage signal v_o via a second low pass filter 10 and inputs a digital representation of a voltage v_o .

However, nothing in the cited material or any other portion of the BGI teaches or suggests a measurement arrangement that *sequentially* measures voltages. Moreover, Macbeth does not remedy the deficiencies of the BGI. Thus, Applicant submits that independent claim 73 is patentable over the combination of the BGI and Macbeth. Claim 74, which depends from independent claim 73, is also patentable over the combination of the BGI and Macbeth for at least the same reasons as those set forth above with respect to independent claim 73, and further in view of its own features.

Furthermore, independent claim 75, and claim 76, which depends therefrom, are also patentable over the combination of the BGI and Macbeth for reasons similar to those set forth above with respect to independent claim 73, and further in view of their own respective features.

Applicant therefore respectfully requests reconsideration and withdrawal of the rejection of claims 73-76, and that these claims be passed to allowance.

Claim 77

Claim 77 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over the BGI in view of U.S. Patent No. 4,622,535 to Ise *et al.* (hereinafter "Ise"). Applicant respectfully traverses this rejection.

Independent claim 77 recites, among other features:

- applying at least two frequency signals to said device;
- obtaining measurements indicative of the voltage across said device and the current flowing through said device at said frequencies;
- and
- processing said measurements in a multiplicative and non divisional manner

The Examiner relies on Figure 1 and pages 2-3 of the BGI to allegedly teach these features. The cited material discloses that a proximity sensor 1 is driven by a drive signal having a

voltage and a resulting current, which can be sinusoidal or transient to allow the impedance to be evaluated. The voltage and resulting current may be at an angular frequency ω . However, nothing in the cited material or any other portion of the BGI teaches or suggests *applying at least two frequency signals to said device*, as set forth in claim 77. For instance, there is no disclosure in the BGI of there being more than one frequency.

Moreover, nothing in the cited material or any other portion of the BGI teaches or suggests *processing said measurements in a multiplicative and non divisional manner*, as set forth in claim 77. The BGI appears to disclose only divisional manners.

Independent claim 77 further recites that processing said measurements is performed *to determine if a first impedance or part of the impedance of the device at a first frequency has a predefined inequality relationship with a second impedance or part of the impedance of the device at a second frequency, without calculating either impedance*. The Examiner relies on col. 3, lines 28-61 of Ise to allegedly teach this feature. However, it appears that inequality relationship in Ise requires the calculation of Z_L and Z_S (i.e., calculation of the impedances), which is not the same as processing the measurements *without calculating either impedance*, as set forth in claim 77.

For at least these reasons, Applicant submits that independent claim 77 is patentable over the combination of the BGI and Ise.

Applicant therefore respectfully requests that the rejection of claim 77 be reconsidered and withdrawn, and that claim 77 and its dependent claims be passed to allowance.

In view of the above amendment, Applicant believes the pending application is in condition for allowance.

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